

REMARKS

In response to the Official Action:

[1-2] No IDS is filed at this time. The Applicants believe that the references listed in the specification are not relevant to the patentability of this application, and therefore, there is no need to file an IDS for them to be considered by the examiner.

[3] A corrected FIG. 5, labeled as "prior art," is attached. No new matter is entered. Approval is requested.

[4] The title is amended as required.

[5-6] Claims 4-5 were rejected under 35 U.S.C. 102(b) as being anticipated by Liaw (U.S. Pat. No. 6,448,140). This rejection is respectfully traversed.

(1) Liaw discloses an oxygen-*steam* process, and steam is H₂O rather than hydrogen.

(2) Referring to Fig. 3 of this application, gaps 34 and 36 are formed between the tungsten silicide 22 and spacers 26 and 29 (page 6, line 24 to page 7, line 12). The gaps are due to the recesses formed on the sidewalls of the tungsten silicide 22 by the previous cleaning step (page 5, line 15 to page 6, line 3).

Liaw forms recesses 8 on the sidewalls of the tungsten silicide 4 by wet etching (Fig. 3 and col. 5, lines 4-12, and col. 4, line 60), but a thermal oxide 9c is grown to fill in the recess 8 (Fig. 4) before the insulator 10 is formed (Fig. 5). In this application, after forming the recess, annealing instead of thermal oxide growth is performed; this step is to activate the gate, source and drain structure (claim 1 step 4, and page 6, lines 5-15).

The Applicants' recess is not intended to be filled before the spacer formation, and just an oxide will be formed on the sidewalls of the polysilicon 16 during annealing. To perform the annealing, the gate stack is exposed in an atmosphere containing oxygen radicals, see page 6, lines 5-18. The Applicants' recess formation is followed by a spacer formation to leave the claimed buffer gaps between the tungsten silicide and spacers. In Liaw's process, the recess is

eliminated by the thermal oxide growth, and no gaps are formed between the tungsten silicide and spacers.

“The resulting silicon oxide sidewall layers, comprised of thick silicon oxide layer 9a, and thin silicon oxide layer 9b,” writes Liaw of its Fig. 4, “presents a straight wall profile, conducive to formation of a non-defective, composite insulator spacer” (col. 5, lines 18-22).

After the straight-sided wall of the layer 9 is formed, a silicon nitride “spacer” 10 is formed (Fig. 5, lines 36-38). “If lateral recess 8,” continues Liaw at col. 5, line 39, “was not previously formed ... thick silicon oxide component 9b, would protrude ... resulting in a conformal silicon nitride layer ... protruding “with negative results, according to Liaw. Avoiding such a protrusion is Liaw’s first object (col. 2, line 20), and avoiding it is intended to overcome a disadvantage ascribed to Liaw’s prior art, which Liaw says produced a “thicker oxide layer protruding [e.g., Fig. 2].... This profile can present difficulties, or a failure mechanism” (col. 1, lines 42-44).

Thus, Liaw teaches that spacer formation is specifically separated into two steps (i.e., Figs. 4 and 5) specifically in order to *fill* the recess 8. Liaw fails to teach the formation of gaps between the tungsten silicide and spacers. Indeed, Liaw teaches against the Applicants’ claimed gaps.

(3) With respect, Fig. 4 of Liaw shows a thermal oxide growth process, but not the Applicants’ annealing process. The Examiner points to Liaw at col. 5, lines 4-10 for disclosing annealing, but the word “annealing” does not appear in this passage, only “thermally grown.”

Thus, Liaw fails to disclose three distinct features recited in independent claim 4.

[7-9] Claims 1-3 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant’s admitted prior art or Woo et al. (U.S. Pat. No. 5,210,047) taken with Liaw and further in view of Huang et al. (U.S. Pub. No. 20030181007). This rejection is respectfully traversed.

The claims now recite “comprising hydrogen and oxygen gases” after “performing an annealing process,” and the Applicant's hydrogen and oxygen gases result in uniform sidewall. Woo nowhere describes this feature (col. 7, lines 11-55). Liaw discloses that a silicon oxide sidewall layer is thermally grown in oxygen-steam ambient, but not “hydrogen and oxygen gases,” and the resultant oxide has non-uniform thickness (col. 5, lines 7-12).

With respect, no combination of the applied references (not admitted obvious) could produce a uniform sidewall. While the thermally grown oxide of Liaw has non-uniform thickness, and the ISSG film of Huang is uniform, these two references could not be combined to produce uniform sidewall as in this application.

Woo also does not disclose “comprising hydrogen and oxygen gases” (col. 7, lines 11-55).

With respect, Choi does not teach “cleaning the tungsten silicide with a solution having a high etch selectivity to the tungsten silicide.”

Therefore, no combination of the applied references could reach the instant claims, since not all of the claimed features are disclosed. Neither would any combination accomplish the object of the Applicant.

The Examiner asserts that Woo discloses annealing at col. 7, lines 10-55, but as with the applied passage of Liaw no mention of annealing is seen there, and there is no explanation of how the long passage supports any disclosure of annealing.

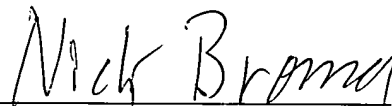
Not one of Liaw, the Applicants' admitted prior art, Woo et al., Huang et al., or Choi et al. teach, or even hint at forming gaps between the tungsten silicide and spacers by a recess formation followed by a spacer formation. As with the rejection of claim 4, two distinct elements are respectfully submitted to be lacking from applied art, and therefore no combination (even if obvious, which is not admitted), could reach the instant claims.

The asserted motivation for combining the references at pages 5-6 is respectfully traversed as being unsupported in the prior art either by citation or by reasoned argument. If the asserted advantage is based on the Examiner's personal knowledge, then Official Notice should be taken; otherwise, the prior art should be cited. If the asserted advantage is based on fundamental principles, then a reasoned argument should be presented.

[10] Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al. taken with Choi et al. (U.S. Pat. No. 6,740,550) and further in view of Huang et al. This rejection is respectfully traversed on the grounds set out above.

Respectfully submitted,

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Date


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